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# The Analysis of Potential Workplace Accidents Using Hazard Identification and Risk Assessment Method

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***Abstract.*** Nowadays, in this globalization era, most of the companies develop machinery and tools supported by a sophisticated technology. They do believe that by using the technology, hope the process of production becomes faster than using pure man power. Moreover the company can produce a huge number of products. However, on the other hands, sometimes an operator who work in a particularly subject to improper machine has skill. Therefore, it is able to cause the work accident which is in the several cases can be fatal. There was a company which has a textile business. It produced strings as an essential material for draperies and carpets. During the operators operate and the production machinery, an unexpected accident occurred. Often if it did not use the right or standard procedure. Refers to that background, the researcher do analysis the potential of workplace accidents in the spinning department by using Hazard Identification and Risk Assessment Method. The results of the research that has conducted in that department was a potential of hazards commonly occur in that workplace are as follows: the worker's fingers has pinched by the machine, the worker's fingers has run over by the machine, unconscious, being injured in hands , and have the material downfall. As for, the hazard that has inflicted be included into the high level of risk, the which is: the worker's fingers has pinched by the machine, the worker's fingers has run over by the machine, unconscious, and being injured in hands. Furthermore the medium level of risk the which is : have the material downfall, and lower level of risk which is : have a shock and legs injured. In addition, refers to the results of the research, the researcher could recommended several inputs to the company, exactly to the worker, the which is : keep fit, wearing a mask during do the job, arranging a space (safe distance) between the worker and the machine, wearing safety tools (safety gloves and shoes included), checking the condition before do the job, making sure that the fiber in the balanced position.

**Keywords:** *Hazard, Hazard Identification, Risk, Risk Assessment, Workplace Accidents, Potential Workplace Accidents.*

## I. INTRODUCTION

In this globalization era, most companies are actively developing the machinery and equipment with high-tech machines. With high-tech machinery that is expected to amount resulting production will be. Lack of knowledge and employee carelessness can cause very fatal accidents. Moreover, if use or operation of the machine does not based on a standard procedure could pose a danger to the operators themselves.

Therefore, it needs supervision in equipment reliability and smooth the process of machining. It is also intended to avoid *shut down* unexpected of the machining process. The rest is also aimed at ensuring safety for workers, making it easier in terms of control and supervision of the health and safety works.

This research was conducted at a company located in East Java, which is engaged in the field of textiles that produce yarn as raw material for fabric and carpet. Where in operating the machinery and other production facilities, it is accompanied with the risk, sometimes can pose a danger to workers or operators if not using standard procedure. Should it be supported by the attention of a company in the field of

occupational safety and health. Where it is natural to be a major concern for every company.

From the daily newspaper Pos Kota, Jakarta, number of work accidents tend to rise the last five years. In 2011 there were 99.491 cases or an average of 414 cases of occupational accidents per day, whereas in the previous year dropped to 98.711 cases of occupational accidents, in 2009 there were 96.314 cases, in 2008 there were 94.736 cases and in 2007 there were 83.714 cases. Meanwhile, in East Java, an effort to increase cultural participation K3 and K3 Management System (SMK3) in the company is done by setting the month K3, socialization, coaching and awards K3 and SMK3. The result in 2012, Java has received awards for Coach of Occupational Health and Safety (K3) related to the increasing number of companies cultured K3 in East Java.

Talking about the implementation of K3 in the textile company, which according to the author's observation, that employees often ignore the use of Personal Protective Equipment (PPE). More companies are already providing some facilities to support health clinic for employees in the form of occupational safety and K3 called *Safety* and EPR *(Emergency Preparedness Response*).

Associated with one of the activities is the production process of spinning yarn in that company are some departments in parts production division include *Spinning Department* (Spinning Top). In this department there are several stages of the process, including the mixing of raw materials *(rayon* and polyester), *blowing, carding, drawing, simplex, ring frame, winding, packing* and *multifold.* According to the writer's observation, more and more of the production process, the opportunities and the potential for accidents and occupational diseases are also high. Due to the use of any production machinery must be accompanied by a risk, although small. These risks could affect the health and safety of employees or operators.

Based on the background as well as some scientific articles references used by the author to conduct this study, the authors take the title "The Analysis of Potential Workplace Accidents Using Hazard Identification and Risk Assessment Method"

**Problem**

From the description of the authors formulate the problem as follows:

a. The points are the potential dangers of what happened at the spinning department?
b. What are the risks posed by each hazard points that could potentially occur in the Spinning in the company?
c. What are the recommendations provided by the company due to the emergence dots potential hazards at the Spinning in the company?

**Limitation and Assumption Research**

**Limitation**

In order for the existing problems can be resolved properly and discussion becomes more directional, so in this study are given some problem definition. The limit problem is as follows:

1. Data used for occupational accidents in 2015 alone.
2. The research location is only on the spinning.
3. In this study only discusses methods of *Hazard Identification and Risk Assessment* (HIRA).

**Research Assumption**

Assumptions which used in this study are:

a. The data obtained by the author during the study considered valid.
b. The situation and the state of the company is considered stable and conducive for this research.
c. Facilities and ancillary equipment are considered eligible for the study.
d. Management of companies and research support personnel considered to understand the topics and matters related to the research, and is able to work just as well for research.

## II. RESEARCH METHOD

### Research Basic Methods

Type of the research that used in this research was descriptive. Descriptive research is the research that describes some data then analyzed and compared based on the fact that the ongoing further attempt to provide remedies that exist in order to obtain better result than before.

### Method of Determining Object Research

Method of determining the area is taken deliberately or purposive making objects deliberately or consideration based on certain criteria (Wiratha, 2006). The location of this research is a company engaged in the textile field, located in Jalan Raya Solo-Surabaya, Nganjuk, East Java. In addition the company needs to implement safety and health policies right so as to enhance the company's reputation and investor.

### Data Collection Method

Data collection techniques in this study are:
a. Interviews, b. Documentation, c. Observation

### Data Analysis Method

In the initial phase of this study, researchers looked for the level of safety risk with the risk analysis method (AZ / NZS) *Australian Standard / New Zealand Standard:* 4360, 1999/2004. By determining the scope to see the spinning process / production process in department. *the spinning.* Followed by identification of the risk of using HAZOP to know the causes, consequences / consequences, actions taken and the severity and

### Data Collection Method

### Data Types and Sources of

Data collection is the process of collecting the data required in both research of secondary data owned companies, as well as primary data based on direct observation and interviews with management and production employees.

a. Primary data obtained through observation and interviews to all employees about 40 people in the area *spinning.* The primary data required in this study include:
   1. Data finding of potential danger *(hazard)* in the production area of the company.
   2. Data accident in 2015.
b. Secondary data, obtained from the archives and documents relating to the company's production process in the form of historical data the company during certain periods. The required data are:
   1. Company Profile.
   2. Organizational structure of the company.

likelihood and degree of risk of the next step of determining the level of risk to the formula:

Value of Risk = Severity (S) x probability (P)

After getting value risk later determine the risk of any accidents that occur, then calculate the statistics of occupational accidents to determine the performance of employees in the textile company and then analyzed using the method of causal analysis to determine what action should be taken and suggested to the company. Here is an example of a table of risk analysis.

Table I
Risk Analysis

| Level risk | value risk | P | S | Impact | Risk | Production Process | Location |
|---|---|---|---|---|---|---|---|
| High risk | 15 | 5 | 3 | 1. Fainting | 1. Material (raw material) fine airborne fiber leads to workers<br>2. operating machines At the time workers are not wearing seat | Mixing usable material *waste* and fresh material using a machine *blendomat* | *Mixing*  |
| High risk | 12 | 3 | 4 | 2. sandwiched Hands | | | |
| High Risk | 12 | 3 | 4 | 1. hand wedged | 1. If at any time the condensor broken | Smooth the material that has | *Blowing* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| High Risk<br><br>Low Risk | 15<br><br>4 | 5<br><br>2 | 3<br><br>2 | hand injured<br><br>2. feet injured | risky hand pinched and injured workers who repair and engine repair *blendomat*<br>2. toe injury / bruise affected clumps fiber | been mixed in the *mixing* and sent to machine *carding* |  |

**Analysis Hazard and Operability (HAZOP)**

HAZOP is defined as a system and form of assessment of a design or existing process or operation with a view to identifying and evaluating the issues that represent risks to individuals or equipment or prevent efficient operation. HAZOP is a qualitative technique that is based on the *GUIDE-WORDS* and implemented by a team of various disciplines during HAZOP process takes place.

The purpose is to review the use of HAZOP a process or a system operating on a systematic basis, to determine whether the process can lead to the occurrence of irregularities or unwanted accidents.

The following terms terminology (Key Words*)* is used to facilitate the implementation of HAZOP are as follows:

a. Deviation
   Is combination of keywords that are being applied (a combination of your words and parameters).
b. Cause
   Is the cause that most likely will result in irregularities.
c. Effects/consequences
   Is a result of an event that is usually expressed as the loss of an event or risk. In determining the consequence should not be doing it because they limit the usual detrimental to the conduct of research.
d. Action (taking action)
   When a cause is believed to lead to negative consequences, should decide what actions should be done. The action is divided into two groups, namely measures that reduce or eliminate the causes and measures to eliminate the consequences. As for what previously decided, it is not always possible, especially when dealing with equipment failure. However, first always endeavored to get rid of the cause, and the only part which needs to reduce the consequences.
e. Severity
   Is the severity of which is expected to occur.
f. Likelihood
   Is the possibility of consequences with existing security systems.
g. Risk
   The possibility of a combination of *likelihood* and severity.

Examples severity value table.

Table II
Value Severity

| Description | Rating | Severity |
|---|---|---|
| Died world, permanent disability / serious, severe environmental damage, leakage B3, financial losses are very large, the cost of treatment of> 50 million | 5 | Catastropic |
| Lost work days, permanent disability / part, damage to the environment being, a huge financial loss, medical expenses <50 million | 4 | Major |
| requires medical care, disruption of work, substantial financial losses, need outside help, the cost of treatment <10 million | 3 | moderate |
| Handling P3K, does not necessarily need outside help, fees being financial, medical expenses <1 million | 2 | Minor |
| Does not disrupt the work process, no injury / wound, a small financial loss, medical expenses <100 thousand. | 1 | negligible |

Table III
Value Level Likelihood

| Description | Rating | Likelihood / Probability |
|---|---|---|
| Always happens | 5 | Improbable |
| Frequent | 4 | Unlikely |
| Sometimes it can happen | 3 | Occasional |
| Maybe it can happen | 2 | Probable |
| Very rare | 1 | Frequent |

Once the value of severity and likelihood are known, we then calculated using tables IV to determining the level of risk involved.

Table IV
Risk Assessment

| Catastropic | Major | Moderate / Serious | Minor | negligible | Saverity Likelihood |
|---|---|---|---|---|---|
| 5 | 4 | 3 | 2 | 1 | Improbable |
| 10 | 8 | 6 | 4 | 2 | Unlikely |
| 15 | 12 | 9 | 6 | 3 | Occasional |
| 20 | 16 | 12 | 8 | 4 | Probable |
| 25 | 20 | 15 | 10 | 5 | Frequent |

.Tabel V
Risk Level

| Description | Risk rank |
|---|---|
| Extrime very high risk-high risk | 17-25 |
| high risk-high-risk | 10-16 |
| medium risk-moderate risk | 5-9 |
| low risk - low risk | 1-4 |

**Cause and Effect Analysis *(Root Cause* Analysis)**

This chart is also called fishbone diagrams *(Fishbone Chart)* and are useful for showing the main factors that affect the quality and has resulted in the problem that we are studying, in addition we can also look at the factors that more detailed influential and has resulted in major factor that we can see of arrows in the form of a fish bone in the *fishbone* diagram.

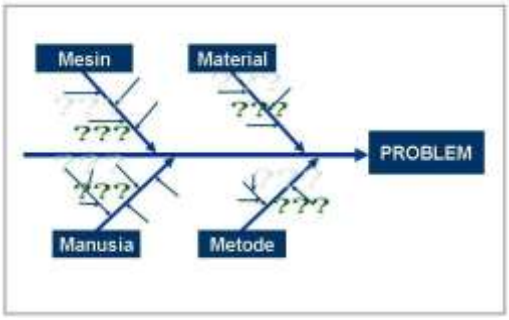
The *Fishbone* diagram was first developed in 1950 by a Japanese quality expert Dr. Kaoru Ishikawa who has s graphic to descript of the elements of a process to analyze the potential sources of process deviations. Factors main cause of this can be grouped in:

1. Material/Raw Materials
2. Machine
3. Man/Labour
4. Method
5. Environment

Factors that cause lies on the left, while the consequences performing the quality characteristics or quality that is the purpose of the system on the right side of the chart.

The usefulness of a causal diagram are:

1. Analyzing the actual conditions that aim to improve quality improvement.
2. Reducing the conditions that cause incompatibility products with consumer complaints.
3. Determining the standardization of ongoing operations or to be implemented.
4. Means of decision-making in determining manpower training.
5. Planning for corrective action.




Source: https://simiesievenfold.wordpress.com

Figure 1 Diagram of cause and effect or *fishbone* chart.

## III. CONCLUSION

Based on the analysis that has been done on the analyzed data, it could be concluded as follows: The

1. Potential dangers that often occur in the spinning department at the textile company is: finger pinched machine, finger crushed machine, unconscious, injured hand, the fall of the material.
2. Risk is the danger posed a high risk that the hand crushed hand machine wedged unconscious machine, hand injuries, the risk being that the fall of material and low risk that shock and leg injury.
3. Giving the recommendations to the company, among others:

a. Maintaining stamina and wearing a mask while working.
b. Arranging a safe distance between the engine and the worker, also wearing safety glove.
c. Ensuring clumps of fiber in a balanced position and in accordance with the communication skills among workers.
d. Checking the condition before doing the task.
e. Ensuring sliver in a balanced position and the corresponding position with the ability to use the roll using s*afety* shoes.
f. Good communication between each workers and ensure the material in a balanced position and according to ability and wearing the safety shoes.

## REFERENCES

[1] A. Permana, Anggi, D. Nugraha, Winardi, H. Moechtar., **Risk Management Analysis (Case study in : Technical Implementation Unit of Testing Boarding and Environment Laborator**y, East Java Province Environment Boarding, Tehnical Environment Department, Engineering Faculty, Diponegoro University.

[2] M. Fil, Socrates., 2003. **Work Safety Risk Analysis Using HIRARC (Hazard Identification Risk Assessment and Risk Control) Method For Suspension Preheater Tool in The Production Department**, Plant 6th and Field 11, Citeureup, Indocement Tunggal Company, Medical and Health Science Faculty, Social Health Study Program.

[3] Arikunto, Suharsimi. 1999. **Research Procedure as Practise Approach**, Balai Pustaka, Jakarta.

[4] Australian Standard/New Zeland Standard 4360 : 1999. **Risk Management Guideline**, Sidney.

[5] Australian Standard/New Zeland Standard 4360 : 2004. Risk Management Guideline, Sidney.

[6] Anizar. 2009. **Work and Safety Technical in Industry**. Graha Ilmu, Yogyakarta.

[7] Cross, Jean. 2000. **SESC9211 Risk Management**. The University of New South Wales, Sidney. Firmansyah, Fathoni. 2009.

[8] http://www.jamsostek.co.id/content/news.php?id=1031, Downloaded at 4th Januari 2012, time 20.00 pm. K. Imam., Soemanto.1992.

[9] Risk Assessment and Management Handbook. Mc Grow Hill Inc, New York.

[10] Regulation of Republic of Indonesia Labor Ministry, No.Per-5/MEN/1996 about Work

and Health Savety Management System. Work Safety Norm Direktorate (DPNK3), Jakarta.

[11] R., Soehatman., 2010. **Practise Guidance in Risk Management Under K3 OHS Risk Management Perspective**. Dian Rakyat, Jakarta.

[12] Ramli., Soehatman., 2010. **Work and Health Safety Management System.**, Dian Rakyat, Jakarta.

[13] Ridley, Jhon. 2008. **Work and Health Safety Management**. Third Edition. Erlangga, Jakarta.

[14] Santoso, G. 2004. **Work and Health Safety Management**. Third Edition. Erlangga, Jakarta.

[15] Smarta, La Tasya Adhanti., Arimbi, Ratna, Dewi. 2012. **Work and Health Safety Effect Analysis.**